

ART 34 AMDT

CLAIMS:

I claim:

1. A fluid treatment apparatus for the removal of solids from fluids, said apparatus comprising:
 - a) a pumping apparatus (10);
 - b) an equalization chamber (15) operatively attached to said pumping apparatus (10) via a first stage fluid transfer conduit (11), said equalization chamber having a base (16) and a top (17) and including an equalization solids discharge (18) at the base of the equalization chamber;
 - c) a clarification chamber (23) operatively attached to the top of the equalization chamber via a second stage fluid transfer conduit (19), said clarification chamber having a base (24) and a top (25) and including a clarification solids discharge (26) at the base of the clarification chamber;
 - d) a second stage chemical injection apparatus (20) operatively attached to the second stage fluid transfer conduit;
 - e) a separated fluid discharge (27) from clarification chamber;

wherein raw fluid containing solids suspended therein is pumped by the pumping apparatus into the equalization chamber where a portion of the solids contained in the raw fluid, being equalization recovered solids, can settle to

the base of the equalization chamber for removal via the equalization solids discharge, the raw fluid then becoming partially separated fluid which moves into the second stage fluid transfer conduit where chemical can be injected into the partially separated fluid by the second stage chemical injection apparatus before the arrival of said partially separated fluid in the clarification chamber where solids remaining in the partially separated fluid can settle to the base of the clarification chamber for removal via the clarification solids discharge, the separated fluid then being discharged from the clarification chamber by the separated fluids discharge;

and wherein the fluid treatment apparatus between the pumping apparatus and the separated fluids discharge is pressurized, by the pumping apparatus.

2. The apparatus of Claim 1 further comprising first stage chemical injection apparatus (12) operatively connected to the first stage fluid transfer conduit between the pumping apparatus and the equalization chamber.
3. The apparatus of Claim 2 wherein the first stage chemical injection apparatus is a mazi injector.
4. The apparatus of Claim 1 wherein the second stage chemical injection apparatus is a mazi injector.
5. The apparatus of Claim 1 wherein the first stage fluid transfer conduit provides a mixing area (13) for the raw fluid before entering into the equalization chamber.
6. The apparatus of Claim 1 wherein the first stage fluid transfer conduit is wrapped around the equalization chamber before entering the equalization chamber.

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- 7. The apparatus of Claim 1 wherein the second stage fluid transfer conduit provides a mixing area (21) for the partially separated fluid before entry into the clarification chamber.
- 8. The apparatus of Claim 1 wherein the second stage fluid transfer conduit is wrapped around the clarification chamber before entering the clarification chamber.
- 9. The apparatus of Claim 1 wherein the interior of the first stage fluid transfer conduit is fitted with internal flighting (14) to provide for agitation or mixing of the raw fluid before entry into the equalization chamber.
- 10. The apparatus of Claim 1 wherein the interior of the second stage fluid transfer conduit is fitted with internal flighting (14) to provide for agitation or mixing of the partially separated fluid before entry into the clarification chamber.
- 11. The apparatus of Claim 1 further comprising a decoupling tank operatively connected to the separated fluid discharge.
- 12. The apparatus of Claim 1 wherein the equalization solids discharge is a valve.
- 13. The apparatus of Claim 1 wherein the clarification solids discharge is a valve.
- 14. The apparatus of Claim 1 further comprising downstream solids sterilization apparatus (29) operatively connected to the equalization solids discharge and the clarification solids discharge.
- 15. The apparatus of Claim 14 wherein the downstream solids sterilization apparatus is a pasteurizer.

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- 16. The apparatus of Claim 14 wherein the downstream solids sterilization apparatus is a storage tank.
- 17. The apparatus of Claim 14 wherein the downstream solids sterilization apparatus is a digester.
- 18. The apparatus of Claim 1 wherein the pumping apparatus is a pump.
- 19. The apparatus of Claim 1 wherein the pumping apparatus is a plurality of pumps.
- 20. The apparatus of Claim 1 further comprising a grinder (30) ahead of the pumping apparatus to grind the raw fluid in advance of pumping.
- 21. The apparatus of Claim 20 wherein the grinder and the pumping apparatus are combined as a grinding pump.
- 22. The apparatus of Claim 20 wherein the grinder and the pumping apparatus are combined as a plurality of grinding pumps.
- 23. The apparatus of Claim 1 further comprising downstream fluids processing apparatus operatively attached to the separated fluid discharge.
- 24. The apparatus of Claim 23 wherein the downstream fluids processing apparatus comprises:
 - a) a sand filter;
 - b) a biological treatment filter; and

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- c) an ultraviolet disinfection unit.
25. The apparatus of Claim 23 wherein the downstream fluids processing apparatus is a sand filter.
26. The apparatus of Claim 23 wherein the downstream fluids processing apparatus is a biological treatment filter.
27. The apparatus of Claim 23 wherein the downstream fluids processing apparatus is a chlorinator.
28. The apparatus of Claim 23 wherein the downstream fluids processing apparatus is an ultraviolet disinfection unit.
29. The apparatus of Claim 1 further comprising a settlement reservoir (9) operatively attached to the pumping apparatus for the collection and storage of raw fluid in advance of pumping into the equalization chamber.
30. The apparatus of Claim 1 further comprising a raw fluid collection system.
31. The apparatus of Claim 30 wherein the raw fluid collection system is a gravity collection system.
32. The apparatus of Claim 30 wherein the raw fluid collection system is a vacuum collection system.
33. The apparatus of Claim 1 wherein the first stage fluid transfer conduit enters the equalization chamber at an angle such that raw fluid entering the equalization chamber is directed towards or against the inner wall of the

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equalization chamber.

34. The apparatus of Claim 33 wherein the equalization chamber is approximately cylindrical in shape.
35. The apparatus of Claim 1 wherein the second stage fluid transfer conduit enters the clarification chamber at an angle such that raw fluid entering the clarification chamber is directed towards or against the inner wall of the clarification chamber.
36. The apparatus of Claim 35 wherein the clarification chamber is approximately cylindrical in shape.
37. The apparatus of Claim 14 wherein the downstream solids sterilization apparatus comprises a gravity settling tank in which the solids are allowed to settle for a period of time, after which the thickened solids are treated biologically in a digester, yielding digested solids.
38. The apparatus of Claim 14 wherein the downstream solids sterilization apparatus is a microwave treatment unit.
39. The apparatus of Claim 1 wherein the clean fluid yielded is potable water.
40. The apparatus of Claim 1 wherein the raw fluid used is groundwater.
41. The apparatus of Claim 1 wherein the raw fluid used is waste water.
42. A method of processing raw fluid to remove solids suspended therein, said method comprising:

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- a) pumping raw fluid (2) into an equalization chamber (15), and allowing a portion of the solids (3) suspended in said raw fluid to settle to the base (16) of said equalization chamber for removal;
 - b) pumping this partially separated fluid (4) from the equalization chamber into a clarification chamber (23), and injecting chemicals into said partially separated fluid before it enters said clarification chamber;
 - c) allowing remaining solids (3) suspended in said partially separated fluid to settle to the base (24) of said clarification chamber for removal; and
 - d) removing separated fluid (5) from the clarification chamber
- wherein the entire process up to the point of exit from the clarification chamber is conducted in a pressurized environment.
43. The method of Claim 42 further comprising injecting chemicals into the raw fluid before entry into the equalization chamber.
44. The method of Claim 42 wherein the solids are removed at the base of the equalization chamber via an equalization solids discharge (18).
45. The method of Claim 42 wherein the solids are removed at the base of the clarification chamber via a clarification solids discharge (26).
46. The method of Claim 42 further comprising mixing the raw fluid in advance of entry into the equalization chamber.
47. The method of Claim 42 further comprising mixing the partially separated fluid in advance of entry into the clarification chamber.

48. The method of Claim 42 further comprising sterilizing the removed solids by pasteurization.
49. The method of Claim 42 further comprising sterilizing the removed solids by digestion.
50. The method of Claim 42 further comprising grinding the raw fluid and the suspended solids therein to a manageable size before pumping the raw fluid into the equalization chamber.
51. The method of Claim 42 further comprising cleaning the separated fluid by sand filtration, biological filtration, and finally by ultraviolet disinfection.
52. The method of Claim 42 further comprising cleaning the separated fluid by sand filtration.
53. The method of Claim 42 further comprising cleaning the separated fluid by biological filtration.
54. The method of Claim 42 further comprising cleaning the separated fluid by chlorination.
55. The method of Claim 42 further comprising cleaning the separated fluid by ultraviolet disinfection.
56. The method of Claim 42 further comprising sterilizing the removed solids.
57. The method of Claim 56 wherein the removed solids are sterilized within a pressurized environment.

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- 58. The method of Claim 56 wherein the removed solids are sterilized in a non-pressurized environment.
- 59. The method of Claim 42 further comprising further cleaning of the separated fluid.
- 60. The method of Claim 59 wherein the separated fluid is further cleaned in a pressurized environment.
- 61. The method of Claim 60 wherein the separated fluid is further cleaned in a non-pressurized environment.

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